FOREST LAND THE BASIC RESOURCE

FROM

"A NATIONAL PLAN FOR AMERICAN FORESTRY"

A Report Prepared by the Forest Service, U.S. Department of Agriculture
in Response to S. Res. 175 (72d Congress)

SENATE DOCUMENT No. 12 – SEPARATE No. 2

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1933

Copies of Senate Document 12, A National Plan for American Forestry, from which this separate has been reprinted, are on sale by the Superintendent of Documents, Washington, D.C. Price $1.75. Remittance should be made by money order.

FOREST LAND THE BASIC RESOURCE

By R. E. Marsh, in charge Division of Forest Economics, and W. H. Gibbons, Senior Forester

CONTENTS

	Page
Extent and general character	121
Forest land for timber use	124
Acreage, description, and distribution	124
Ownership of commercial forest land	129
The protective function of forest land	139
The use of forest land for recreation	141
Use of forest land for game	143
The range resource of forest lands	144
Summary of forest land situation	146
Present areas	146
Agricultural-land abandonment	148
Prospective area available for timber production	149

EXTENT AND GENERAL CHARACTER

What is the forest-land resource of the United States? It consists mainly of about 495 million acres,[1] or one fourth of the land area of

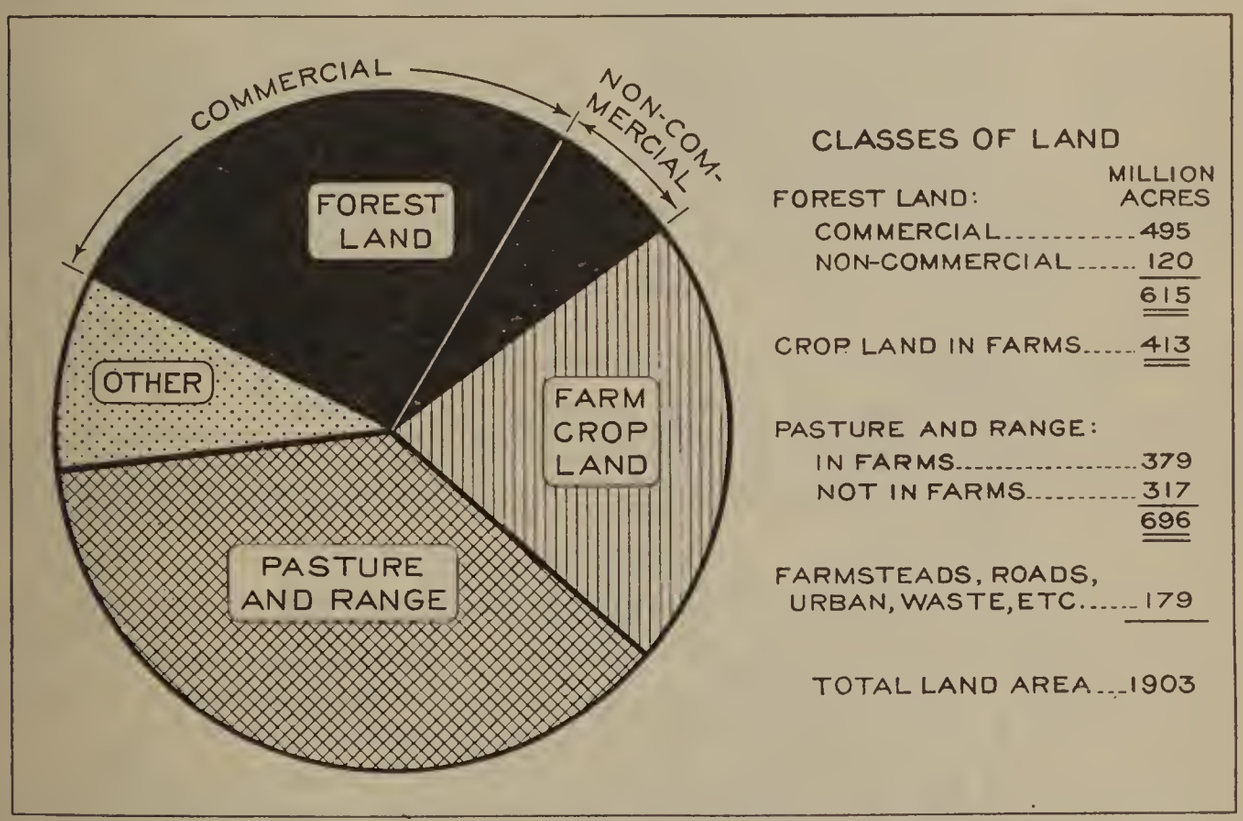

Figure 1.—Land area of continental United States (excluding Alaska) by major economic uses, 1929.

the continental United States (exclusive of Alaska), which may be capable of producing timber of commercial quantity and quality under present or reasonably conceivable future conditions (fig. 1).

[1] The data presented in this section and in the section, "Present and Potential Timber Resources", are based on a rapid extensive survey by the Forest Service in 1931, in which were tabulated forest areas, volume of standing timber, the rate at which the timber is growing, the annual rate of its use and destruction, and our actual requirements for forest products. In this compilation, the aid was employed of many cooperating agencies and individuals, the best available data were gathered and assembled, and the result checked with the judgment of well-informed men in the different forest regions. Although accuracy and consistency in detail are impossible in such an extensive survey, the broad general view of the forest situation thus made available will be valuable in the interim before the results of the more comprehensive and intensive Nation-wide forest survey now in progress by the Forest Service shall be available.

It includes also some 11 million acres of commercially valuable lands in the form of parks, preserves, etc., withdrawn from timber use; and 109 million acres of open-grown pinon-juniper lands in the West, chaparral in southern California, remote and inaccessible alpine ranges, and other areas which because of low productivity or extreme inaccessibility appear to be permanently out of the commercial timber-producing class (table 1). Much of this latter noncommercial land, which is inferior for timber production, has, however, a high value in terms of stream-flow control and prevention of erosion. The chaparral lands, for example, are extremely important in conserving the water supply for highly intensive agricultural projects. Figure 2 shows diagrammatically the arbitrary State groups which are used for statistical purposes. It shows also the principal types of forest.

TABLE 1.—*Forest areas of the United States, by broad classes and regions*

Region	Total	Commercial [1]	Noncommercial		
			Total	Withdrawn from timber use [2]	Chiefly valuable for purposes other than timber [3]
	Acres	*Acres*	*Acres*	*Acres*	*Acres*
New England	27,434,000	27,273,000	161,000	79,000	82,000
Middle Atlantic	29,770,000	27,139,000	2,631,000	2,467,000	164,000
Lake	60,345,000	55,895,000	4,450,000	2,578,000	1,872,000
Central	66,059,000	64,249,000	1,810,000	544,000	1,266,000
South	216,868,000	190,758,000	26,110,000	589,000	25,521,000
Pacific Coast	81,295,000	66,685,000	14,610,000	1,753,000	12,857,000
North Rocky Mountain	43,187,000	32,329,000	10,858,000	441,000	10,417,000
South Rocky Mountain	89,600,000	30,570,000	59,030,000	2,510,000	56,520,000
Total	614,558,000	494,898,000	119,660,000	10,961,000	108,699,000

[1] Land capable of producing timber of commercial quantity and quality, and available for commercial use.

[2] Fair to good timber-producing land withdrawn from timber use, as in parks.

[3] Land characterized by scrubby or very inaccessible forest, such as pinon-juniper stands of the Southwest, scrubby mountain or alpine stands, and chaparral. Over 60 percent is publicly owned, some of which is withdrawn from timber use. Much of the area has an important value in protecting the watersheds of navigable streams, preventing or reducing soil erosion, protecting wild life, providing game cover, etc.

Forest land constitutes a basic and indispensable national resource. Upon its continued productivity depend a permanent and economically available supply of timber products, the maintenance of forest industries, and in turn the local prosperity based largely upon these industries. To grow the timber for lumber, pulpwood, fuel wood, fence posts, and the many other timber products demanded by modern civilization constitutes what we may term the timber use or timber supply function of forest lands. It represents their more tangible economic value or use.

Forested land affords benefits of far-reaching importance through its favorable influence in regulating stream flow, in preventing excessive erosion, and in providing shelter against wind and drought for homes, crops, and livestock. The sum of these protective influences constitutes one of the major uses of forested land.

Recreation, using the term broadly to include the entire range from simple picnicking and sight-seeing to prolonged wilderness camping, and the spiritual and inspirational stimuli afforded by nature's

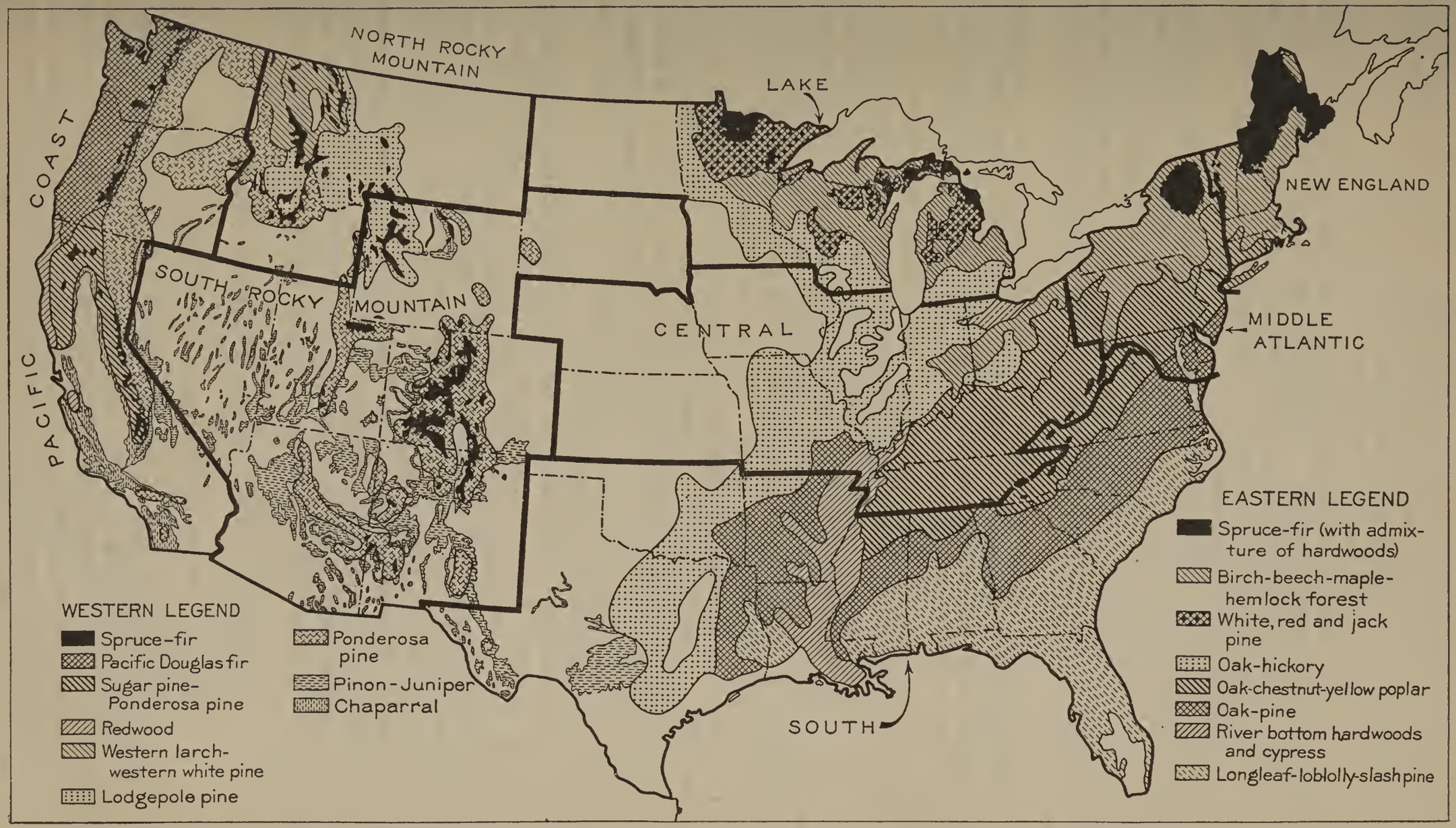

FIGURE 2.—Forest regions and principal types of forest (based on forest cover map "Forests of the United States" by Zon and Shantz).

forested wonders, is now a major forest-land resource or function. Its importance is rapidly growing with the remarkable progress in transportation and communication, the reduced hours of labor, and the consequent increase in time available for recreation.

Forest lands furnish the environmental conditions in whole or in part upon which a large percentage of the game, fur bearers, and other wild life of the country depend. Affording as it does the basis for a large part of the commercial returns incident to game production, as well as for recreational hunting and fishing, wild life constitutes one of the basic forest-land resources.

Upon more than half of the forest lands of the country the forage produced by herbaceous and shrubby plants is grazed by domestic livestock. This range is an essential factor in the economy of countless livestock ranches, farms, and communities as now constituted. Forest range is then another major resource or use afforded by forest land.

The benefits afforded by the protection, recreation, game, and range uses of forest lands, though not so readily appraised, may well represent values to the public far greater in the aggregate than those to be realized from commercial timber. On specific tracts the values inherent in any one use may transcend those of all the other uses.

A notable and highly advantageous characteristic of forest land is that these major uses are not mutually exclusive. Forest land may at one time serve efficiently all of these uses. Exceptions, of course, occur where one or more should be excluded because of the highly specialized or intensive needs of others. For example, timber use is excluded from the national parks. But even there the forest land does not serve its recreation function alone, for it also affords protection benefits. Timber use is often excluded from municipal watersheds in the interest of full protection of city water supplies. Characteristically, then, forest land is a multiple-use resource par excellence, a fact which greatly enhances its economic value and all-round usability as a basic national resource.

Forest land will be considered in further detail with reference to these major uses. The greater length at which the timber phase of forest-land use is treated throughout this report is reflected in this section in the discussion of the timber use of forest land. The presentation under timber use is closely associated with other sections, and should be read in connection with some of the closely related phases, such as Present Timber Supplies and Timber Growth presented in the section "Present and Potential Timber Resources." The protection, recreation, game, and range uses dealt with briefly, following the discussion under timber use, are treated in full in the sections on those subjects.

FOREST LAND FOR TIMBER USE

ACREAGE, DESCRIPTION, AND DISTRIBUTION

Clearing land for agriculture was the largest single factor in reducing the original 820 million acres of comparable forest land in this country to the 495 million acres now available, theoretically at least, for commercial timber growing. In large part this conversion to a more intensive use constituted a natural and desirable economic trend, but it by no means indicated an indefinitely continuing process of converting timberlands to farms. A considerable area of converted

land has already proved submarginal for agriculture. Furthermore, even during that early period when there existed the greatest popular demand for farm land in our history, scores of millions of acres of forest land were cut over or burned over and not brought into farms.

During the last decade or more an important and striking reversion has occurred in this trend nationally. The abandonment of agricultural lands has been the largest factor in a gradual but evident increase in forest areas. In certain regions, notably New England and the Middle Atlantic, this reversion commenced many years earlier. How extensive this change is, cannot be accurately estimated. The fact that the Forest Service in 1922, in a report Timber: Mine or Crop? (in United States Department of Agricultural Yearbook for 1922), estimated but 470 million acres of forest land—in contrast with the present estimate of 495 million acres—is not conclusive evidence on this point owing to the manner in which that earlier report was compiled; but there is reason to believe that the reversion of once cultivated land accounts for a considerable part of the difference between that estimate and the present one. This most recent increase in forest acreage is continuing. The reversion of other millions of acres of low-grade farm land is in progress or evidently pending. In all this process many perplexing questions of economics and of social standards or customs are involved.

Even allowing for some back-to-the-land movement as the result of the present economic depression, it is difficult to foresee any keen competition on the part of agriculture for large areas of forest land. On the contrary, it seems certain that our forest land, at least the area available for forest purposes, will materially increase. The section "The Agricultural Land Available for Forestry" estimates that 52 million acres are now available for forest use through agricultural abandonment or for other reasons and that this may be augmented by 25 to 30 million acres by 1950. Some of this land will in time become forested through natural processes. Some may be planted to forests. Most of it would fall within the commercial forest-land zone.

As will be evident in the later discussion, the term "commercial forest land" is used in a broad sense to mean not only land bearing present timber stands that could be economically utilized—for example, under the 1929 market and operating conditions—but also other forest land on which present or future timber stands can be economically utilized under reasonably conceivable future conditions. It will be shown in other sections of this report that appreciable areas of this commercial forest land will need to be withdrawn from timber use for recreational or other nontimber uses. In short, because of the prospective withdrawals for other major forest uses and because of the actual economic unavailability of the timber on much of the so-called "commercial forest land" under present and recent conditions, our effective forest-land capital for supplying our timber needs is now and may always continue to be considerably less than a half billion acres.

Neither our commercial forest-land acreage in the broad sense used in this report, nor in the narrower sense of land from which timber stands could now be economically utilized, can be considered stable. It will vary with the play of economic forces and changing

social customs and usages. The effects of these changing conditions cannot be precisely foretold in terms of forest-land acreage. Of primary importance, however, are such questions as the quality and quantity of timber the forest lands will produce, whether these lands will be more or less than adequate for the best interests of our people, whether a national sufficiency will actually provide a regional sufficiency measured in terms of the forest products most needed, and to what degree public or private ownership of timber-use lands is to our best advantage. These and similar questions suggest the necessity for careful consideration of our commercial forest-land areas in the solution of many of the nation's major economic problems and in the planning of programs of forest-land use.

Table 2 and figure 3 show the distribution regionally of commercial land bearing timber of different conditions of growth—that of saw-timber size, that of cordwood size, of smaller growth on fair to satisfactory restocking areas, and, finally, the relatively unproductive areas termed poor to nonrestocking.[2]

TABLE 2.—*Commercial forest area of the United States, by character of growth and region*

Region	Total		Saw-timber areas			Cordwood areas	Fair to satisfactory restocking areas	Poor to nonrestocking areas
			Total	Old growth	Second growth			
	Thousand acres	*Percent*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*
New England	27,273	6	13,860	7,976	5,884	4,843	6,145	2,425
Middle Atlantic	27,139	5	7,294	26	7,268	10,518	5,998	3,329
Lake	55,895	11	5,095	2,664	2,431	8,880	28,165	13,755
Central	64,249	13	21,224	1,664	19,560	25,592	12,245	5,188
South	190,758	39	57,265	14,338	42,927	52,702	37,236	43,555
Pacific Coast	66,685	13	44,140	38,892	5,248	6,683	6,190	9,672
North Rocky Mountain	32,329	7	17,026	15,172	1,854	5,704	5,933	3,666
South Rocky Mountain	30,570	6	22,741	18,123	4,618	5,959	161	1,709
Total	494,898	100	188,645	98,855	89,790	120,881	102,073	83,299

Commercial forest land is present in every major region of the United States in such quantity as to be an important basic resource. It will be shown in the section Present and Potential Timber Resources, however, that the populous and important wood-consuming New England and Middle Atlantic regions apparently cannot be wholly and permanently self-supporting as to timber supplies. They are now and probably will continue to be partially dependent, therefore, upon the South and West, a very favorable relationship insofar as the encouragement of forestry in the latter two regions is concerned. However, these interregional relationships account for numerous complexities in the formulation of regional and national forest-land policies.

Of outstanding significance, regionally and nationally, are the forest-land resources of the Pacific Coast, because of their potentially large timber-producing capacity and their enormous stands of virgin timber; and those of the South because of the great area (39 percent

[2] Saw timber denotes areas characterized by trees large enough for sawlog production regardless of their actual use. In recent years over 30 percent of the saw-timber cut has been used for other than lumber manufacture. Cordwood denotes areas characterized by trees too small for saw logs but large enough for cordwood use, regardless of whether the stand is cut for cordwood or held for saw timber. Good, fair, poor, and nonrestocking refer to areas characterized by 70 percent or more, 40 to 69 percent, 10 to 39 percent, and less than 10 percent, respectively, of normal stocking with trees for the most part below cordwood size.

of the commercial forest land of the United States), the ease with which forests are renewed, their rapid growth, and the relative proximity to important consuming centers. The ultimate theoretical timber-producing possibilities of all the forest lands in these two regions, carefully managed, appear to be in excess of the consumptive capacity of these same regions as measured by current standards.

Although the permanently productive use of forest land for timber purposes is in itself highly desirable, this is economically feasible, insofar as timber supplies are the primary purpose, only if the timber can be marketed profitably. This points to the fundamental question, rendered temporarily more acute in the Pacific Coast region by the presence of large volumes of virgin timber, whether or not other

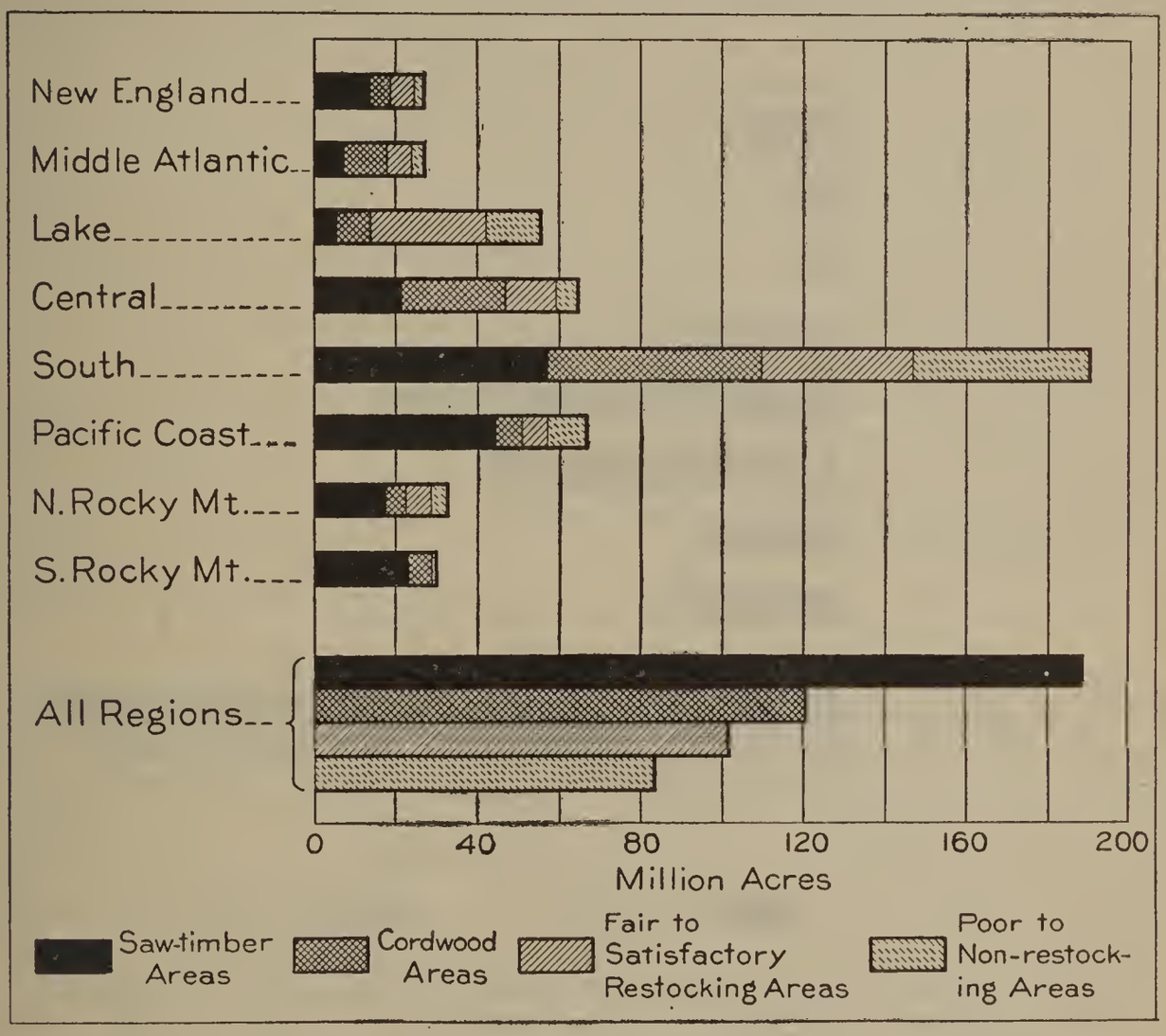

FIGURE 3.—Forest area (commercial) of the United States by region and character of growth.

regions of the United States and, for that matter, foreign countries can most advantageously and economically fill some of their own needs for timber products from the surpluses that can be grown and probably will not be needed in the South and West. Upon the answer to this question must partly hinge the justification for expenditures to keep all of the forest lands in these two regions permanently productive.

Parenthetically, the authors hazard the opinion that with such interregional dependence for timber supplies, the United States as a whole is not likely to use as much timber as would be used if all regions had ample supplies at home. It is believed that proximity to abundant forest supplies and to wood-using and other forest industries tends to make people forest conscious and apt to consume more timber and timber products than they would if these must be brought from distant points even though at reasonable cost.

The 189 million acres of land bearing saw timber is divided about equally between old growth and second growth. The old growth is, of course, located mostly (see table 2 and fig. 4) in the three western regions with the Pacific Coast predominating, while the second growth is mainly in the eastern half of the country with the South far in the lead. The presence of these large areas of old-growth saw timber in the Pacific Coast region and of second-growth saw timber in the South does not, however, indicate correspondingly large volumes of timber available for cutting at present within these two great forest regions. The extensive second-growth lands in the South represent immature actively growing timber which is now being cut extensively, but which far more desirably should be retained as growing stock. On the other hand, western old-growth areas support heavy stands of mature,

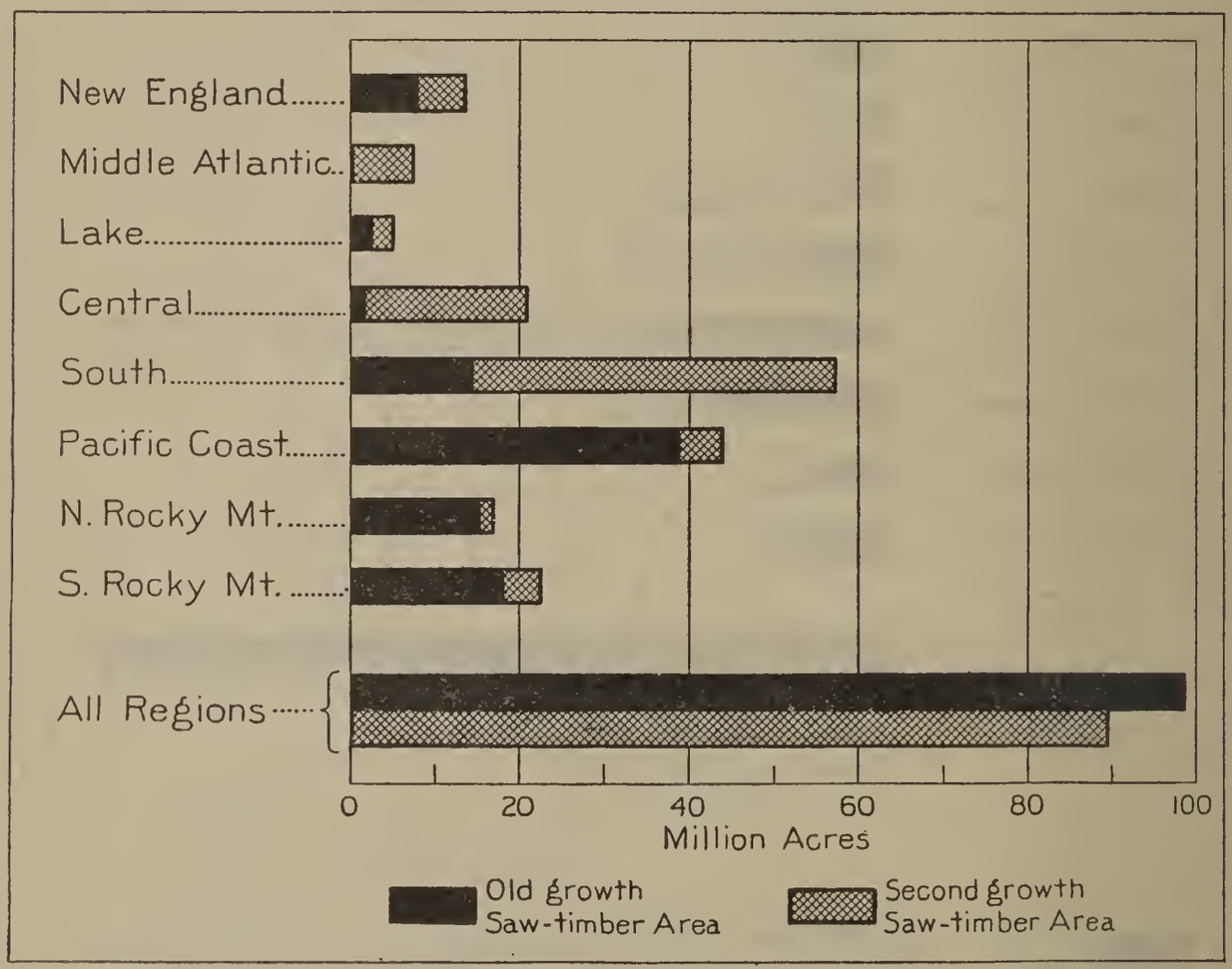

FIGURE 4.—Old-growth and second-growth (commercial) saw-timber areas by regions.

high-quality timber suitable for cutting. The desirable interregional coordination thus implied is discussed further in the section, "Present and Potential Timber Resources".

The great bulk—85 percent—of the 185 million acres of restocking and nonrestocking lands are, as would be supposed, to be found in the East. In fact they constitute 43 percent of all the eastern forest land. This is the type of forest land upon which fires have caused or may cause much serious though often unspectacular damage. From the standpoint of areas involved, the problem of protecting restocking land looms large in the eastern forest regions and more especially in the South. Similarly, the problem of artificial reforestation of already denuded lands is mainly an eastern one, possibly most serious in the Lake region. Figure 3 and table 2 indicate, however, that except for the southern Rocky Mountain region with its insignificant areas of restocking and nonrestocking, the poor to nonrestocking

exceeds the fair to satisfactory restocking by a larger percentage in the Pacific Coast region than anywhere else. It is common knowledge that adequate protection against fire on cut-over areas is, in every region, one of the most vexatious problems. Its solution, of course, is the sine qua non to keeping the forest lands in the Douglas fir type permanently productive.

Eighty-three million acres are classed as either poor or nonrestocking, of which the latter makes up 34 million. Although it is possible that as much as a fourth of the area of 83 million acres will produce some commercially valuable saw timber within the next saw-timber generation, no such hope is believed tenable in the absence of planting for the remaining 60 million acres and more. This great area, idle largely because of fires and improvident logging methods, constitutes a most serious feature of the forest situation. Except as it may be restocked by artificial means and at large expense, it seems likely to have little timber-producing significance for many years. In other words, as a practical proposition, this area will, unless artificially restocked, reduce for many years to come and to a very considerable extent the commercially effective forest land capital.

The wide differences in proportionate distribution of forest land in the different regions according to conditions of growth or broad age classes is illustrated by figure 3. The Lake region is characterized by a strikingly large proportion—42 million acres of a total of 56 million, classed as restocking or nonrestocking in comparison with only 5 million of saw timber and 9 million of cordwood. The generally recognized fact is here clearly shown that the eastern regions are nearly always characterized by a much lower proportion of saw-timber land than are the western regions.

OWNERSHIP OF COMMERCIAL FOREST LAND

The character of forest land ownership is especially important from several standpoints. It affects the owner's interest in the land as distinct from the merchantable timber; his willingness to handle his property so as to keep it continuously productive; and his ability to bear the long-time financial burden required to produce commercial crops on land from which the growing stock has been removed or severely depleted.

Where the timber of a whole region is cut off in a short period of time, even though all the forest land is restocked promptly with commercial species, the industries and the people depending on them must move to other localities. After a new crop of timber matures new industries may be established and the process repeated. Such intermittent industry entails great waste of raw material, high depreciation charges for plant and operating facilities, and disastrous and far-reaching disruption of the economic and social structure. If, so far as timber products are concerned, forest lands are to be most effectively used, if forest regions are to be permanently productive and the homes of stable prosperous populations, their wood-using industries and towns must be established on a permanent basis. And so it is that a system of management of forest lands that will result in a region as a whole, a locality, or even a single ownership supplying merchantable material continuously—in other words, a system of sustained yield management—is highly desirable. One important gauge of land ownership is, therefore, how well it adapts itself to sustained yield management.

INDUSTRIAL OWNERSHIP

Industrial ownership is the most important type of forest land ownership in the United States, not only because it includes over half of the commercial acreage, but because it is here that the Nation's forest problems especially reside. Two hundred and seventy million acres (see table 3 and fig. 5), or well over half of the commercial forest land—by and large including the best—is owned by land, lumber, pulp and paper, and mining companies, naval stores operators, railroads, and miscellaneous individuals or agencies. With some notable exceptions these owners have not been convinced of the financial justification for the measures that would insure keeping this land continuously and permanently producing timber.

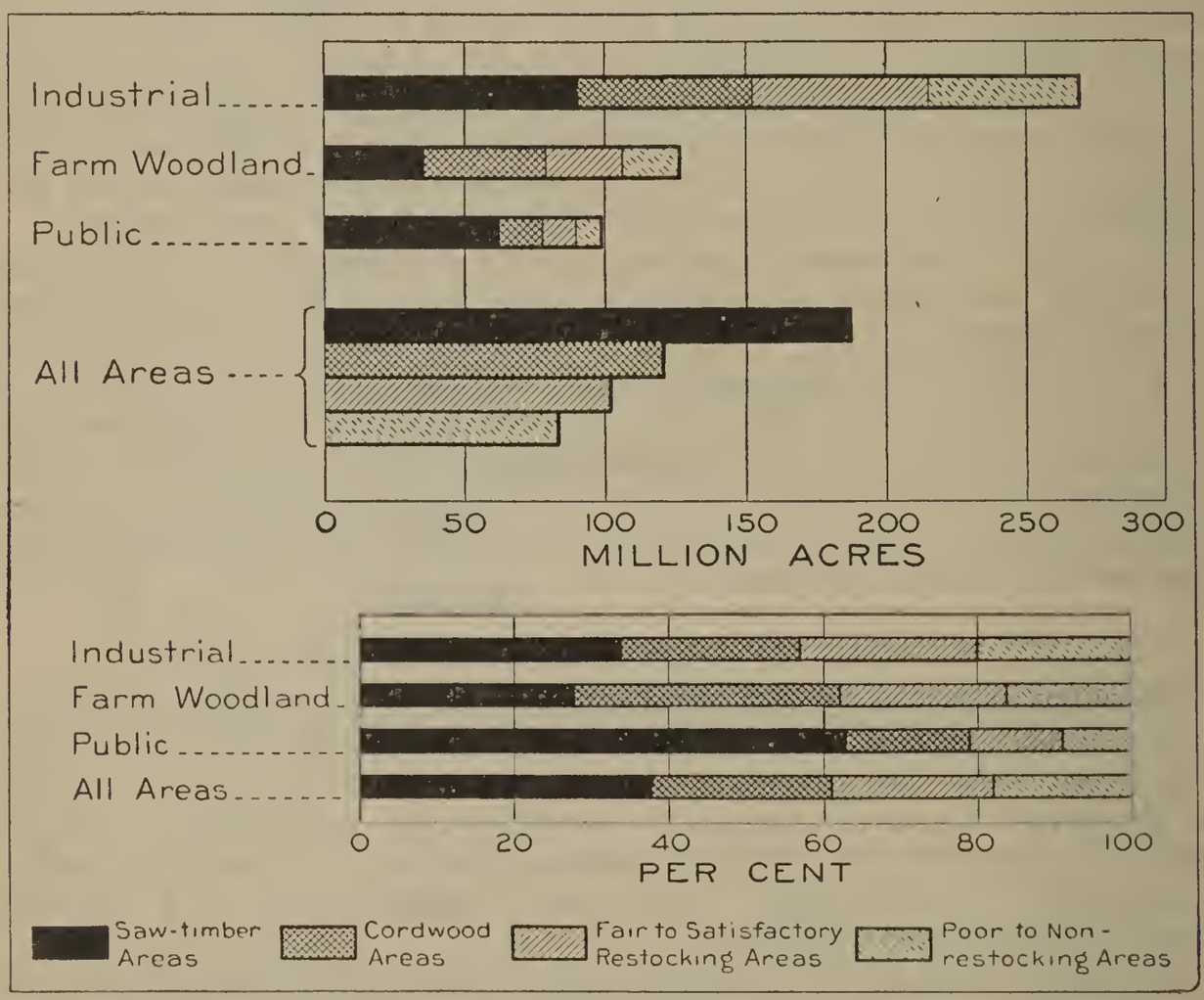

FIGURE 5.—Character of growth in each ownership class on commercial forest areas.

It is undoubtedly true that private forestry practice would have been and is now economically advantageous on a much broader scale than has been in effect. Nevertheless private owners face some very disconcerting problems and uncertainties in embarking upon forestry programs. The following might be listed as examples: Existing methods of forest taxation—especially the uncertainty as to the amounts that must be paid in the future before revenues begin to come in from those properties that are not now on a sustained or continuous yield basis; the danger of losses by fire and other destructive agencies against which existing protection is far from uniformly adequate, and for which commercial insurance is not commonly available at attractive rates; the unavailability of favorable long-time credits on a basis comparable, for instance, to that on which farm loans can be obtained; the uncertainty as to what changes a few decades may bring in the

amount of timber products consumed or as to value in relation to costs of production—in short, the uncertainty of future returns; and beyond this the aversion of the average American to embarking on a long-time enterprise as against one which promises quick returns, even if the former appears thoroughly sound on its own merits.

TABLE 3.—*Ownership of commercial forest areas of the United States, by regions*

ALL AREAS

Region	All areas	Federally owned or managed				State, county, and municipal	Private		
		Total	National forest	Indian reservation	Other		Total	Industrial	Farm woodland
	Thousand acres	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*
New England	27,273	471	471			824	25,978	19,576	6,402
Middle Atlantic	27,139	347	317		30	1,861	24,931	15,470	9,461
Lake	55,895	2,955	1,800	1,140	15	3,867	49,073	34,792	14,281
Central	64,249	581	579		2	191	63,477	31,319	32,158
South	190,758	3,213	3,137	56	20	281	187,264	129,398	57,866
Pacific Coast	66,685	31,811	26,046	3,413	2,352	1,837	33,037	27,938	5,099
North Rocky Mountain	32,329	23,725	22,036	833	856	1,266	7,338	5,925	1,413
South Rocky Mountain	30,570	24,924	20,293	1,986	2,645	505	5,141	5,098	43
Total	494,898	88,027	74,679	7,428	5,920	10,632	396,239	269,516	126,723

SAW-TIMBER AREAS

New England	13,860	248	248			351	13,261	10,834	2,427
Middle Atlantic	7,294	30	29		1	64	7,200	3,732	3,468
Lake	5,095	474	353	121		197	4,424	2,631	1,793
Central	21,224	220	218		2	83	20,921	8,763	12,158
South	57,265	1,941	1,884	49	8	104	55,220	41,491	13,729
Pacific Coast	44,140	24,129	19,852	2,815	1,462	1,104	18,907	17,167	1,740
North Rocky Mountain	17,026	12,623	11,605	573	445	849	3,554	3,190	364
South Rocky Mountain	22,741	19,612	15,606	1,746	2,260	351	2,778	2,744	34
Total	188,645	59,277	49,795	5,304	4,178	3,103	126,265	90,552	35,713

CORDWOOD AREAS

New England	4,843	112	112			190	4,541	2,841	1,700
Middle Atlantic	10,518	48	40		8	772	9,698	6,085	3,613
Lake	8,880	578	510	68		469	7,833	3,226	4,607
Central	25,592	158	158			66	25,368	12,936	12,432
South	52,702	638	631	3	4	51	52,013	32,224	19,789
Pacific Coast	6,683	3,476	2,755	441	280	109	3,098	2,170	928
North Rocky Mountain	5,704	4,550	4,296	112	142	129	1,025	716	309
South Rocky Mountain	5,959	4,146	3,567	222	357	127	1,686	1,683	3
Total	120,881	13,706	12,069	846	791	1,913	105,262	61,881	43,381

FAIR TO SATISFACTORY RESTOCKING AREAS

New England	6,145	86	86			208	5,851	4,279	1,572
Middle Atlantic	5,998	140	131		9	786	5,072	3,348	1,724
Lake	28,165	1,206	543	651	12	2,276	24,683	19,284	5,399
Central	12,245	133	133			34	12,078	6,885	5,193
South	37,236	373	366	3	4	61	36,802	24,718	12,084
Pacific Coast	6,190	1,610	1,166	104	340	256	4,324	3,205	1,119
North Rocky Mountain	5,933	4,226	3,935	96	195	167	1,540	1,133	407
South Rocky Mountain	161	143	135		8	2	16	11	5
Total	102,073	7,917	6,495	854	568	3,790	90,366	62,863	27,503

TABLE 3.—*Ownership of commercial forest areas of the United States, by regions*—Continued

POOR TO NONRESTOCKING AREAS

Region	All areas	Federally owned or managed				State, county, and municipal	Private		
		Total	National forest	Indian reservation	Other		Total	Industrial	Farm woodland
	Thousand acres	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*	*Thousand acres*
New England	2,425	25	25			75	2,325	1,622	703
Middle Atlantic	3,329	129	117		12	239	2,961	2,305	656
Lake	13,755	697	394	300	3	925	12,133	9,651	2,482
Central	5,188	70	70			8	5,110	2,735	2,375
South	43,555	261	256	1	4	65	43,229	30,965	12,264
Pacific Coast	9,672	2,596	2,273	53	270	368	6,708	5,396	1,312
North Rocky Mountain	3,666	2,326	2,200	52	74	121	1,219	886	333
South Rocky Mountain	1,709	1,023	985	18	20	25	661	660	1
Total	83,299	7,127	6,320	424	383	1,826	74,346	54,220	20,126

There is one important feature of private forest land ownership in the United States, not usually emphasized, which undoubtedly has

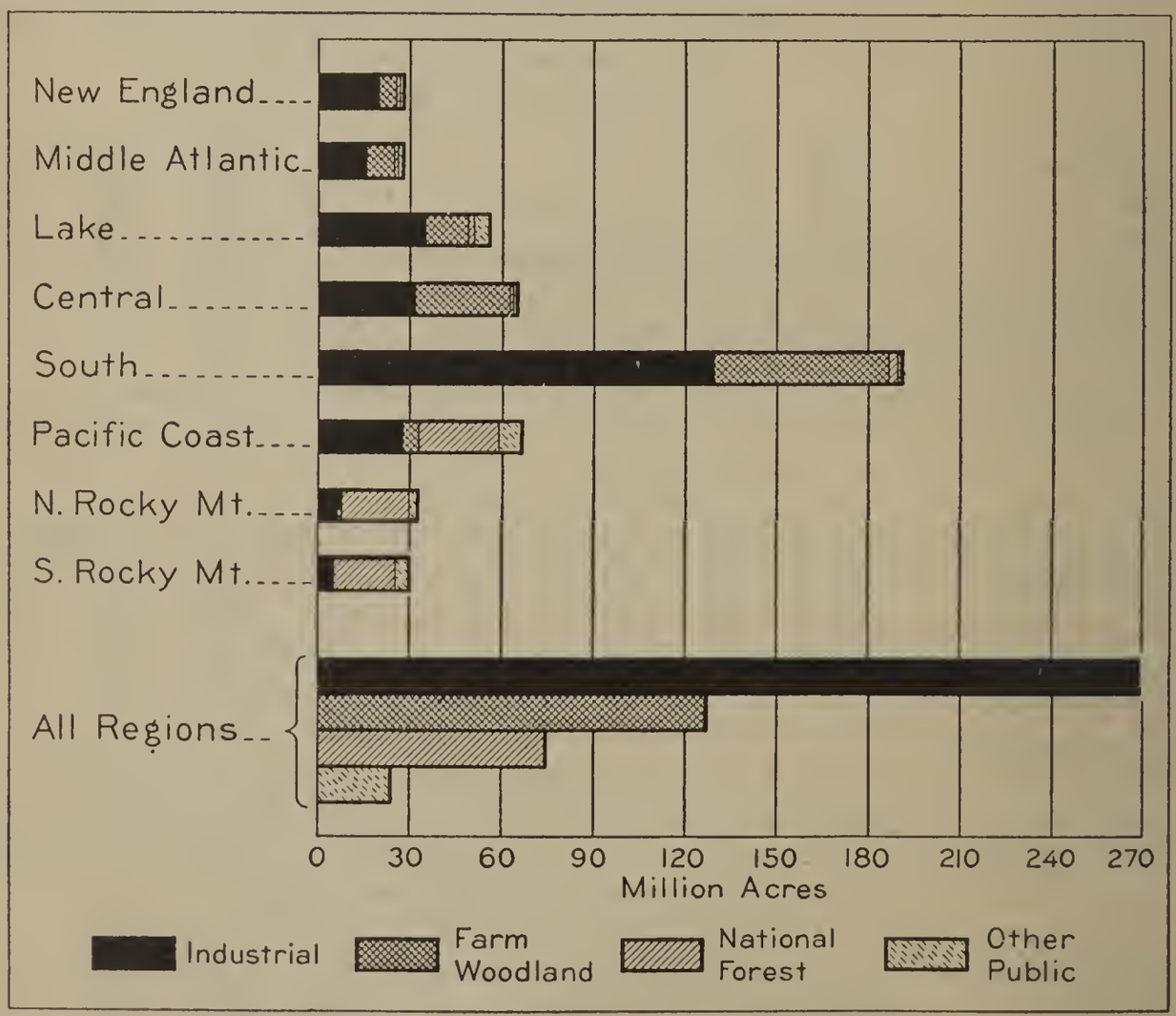

FIGURE 6.—Ownership of forest area (commercial) by regions.

an important bearing upon the management of forest properties. Data are not available for authentic estimates, but it is common knowledge that very large portions, particularly of the larger tracts

of forest land, are owned by lumber manufacturers. The special problems of the forest property thus become involved with those of the manufacturing plant. This has both its advantages and disadvantages, but there is reason to think that in many instances forestry would be facilitated by complete separation of the forest-growing enterprise from the problems peculiar to manufacturing and marketing.

The generally known fact that industrial forest land ownership is the predominating type of ownership in the eastern regions, whereas public ownership predominates in the three western regions, is shown graphically in figure 6. Of the industrial acreage, 86 percent is in the East as against 14 percent in the West. Even so, the industrial ownership in the Pacific Coast region is very important both because it includes land that potentially is highly productive and also because considerable areas bear virgin stands, which are pressing for liquidation. The South includes nearly one half of the industrial lands for the entire country. In the Central region industrial ownership about equals that for farm woodlands, but elsewhere it is much in excess.

Figure 5 visualizes the distribution of age classes for industrial, farm woodland, and public ownerships, respectively, both on an acreage and on a percentage basis. It is apparent that the proportion of saw-timber area for industrial, though slightly more than for farm woodland, is much less than for public ownership. The contrast for industrial and public ownership would be greater if limited to old growth. On the other hand, the proportion of restocking and nonrestocking areas is notably larger for industrial, and somewhat larger for farm woodland than for public ownership. Such broad generalizations in themselves, however, may be misleading. The situation must be considered in the light of various influencing circumstances. For example, public ownership, including the extensive western national forests, still holds large areas of virgin timber cut over only in small part because of their inaccessibility and because of conservative selling policies. A more detailed view by regions is afforded by figures 7, 8, and 9.

The situation in New England in respect to age class areas needs some explanation. Over 50 percent of the area is classed as saw timber. This is because of the large areas of mixed spruce and hardwood forest in northern New England which have been culled for softwoods alone and now remain as an essentially unbroken old-growth hardwood saw-timber forest. Much of the old-growth hardwood thus classed as saw timber is of poor quality and largely inaccessible because of lack of transportation facilities other than the streams. The situation is in reality therefore not as favorable as appears from the figures; aside from this large area of almost inaccessible hardwood of doubtful quality the area of usable saw timber is relatively small. In the Lake region the situation is extremely acute. Less than 10 percent is saw timber, over 50 percent is fair to satisfactory restocking, and 25 percent is poor to nonrestocking. The significance of this is that forest depletion has gone so far in the Lake region that many years will be required to rehabilitate the growing stock to the point that a sustained yield in keeping with the productive capacity of the land can be attained. Other regions are intermediate. Industrial ownership in the South, for example, is characterized by a relatively large area in the restocking and nonrestocking classes.

It is noteworthy that 31 million acres, or more than half of the industrially owned area of poor and nonrestocking land in the entire country, is located in the South where also occur (see section, "Present and Potential Timber Resources") by all odds the largest proportionate acreage annually burned over and the greatest lack of organized fire protection. One of the most serious though less spectacular phases of forest-fire damage lies in the destruction of the small trees on re-

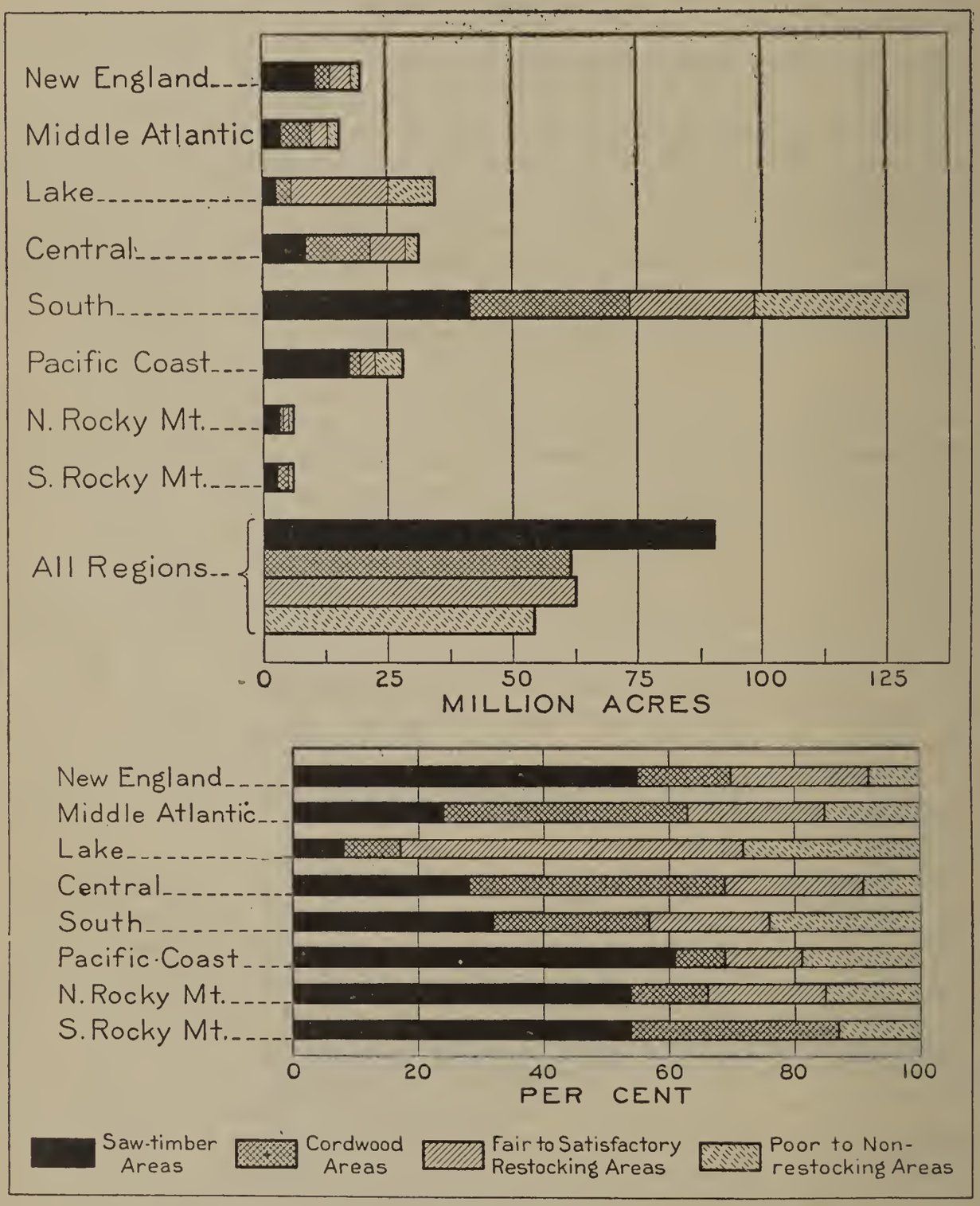

FIGURE 7.—Industrial forest area, by region and character of growth.

stocking areas which, if burning be continued, soon relegates these areas to the nonrestocking or denuded classification.

At the same time, it is significant that 63 million acres of industrially owned cut-over land is classed as satisfactorily or fairly restocking. This is indicative of the ability of most forest lands to restock naturally if given a fair chance, and it is undoubtedly in considerable part at least the fruit of organized fire protection and of the interest and efforts of individual owners in fire protection. With adequate

care during and following cutting it would seem that future forest denudation could be held to very small proportions.

The large areas of cut-over land that are burned also reflect in part the usual lack of concern of private owners as to what happens to the future timber crop on land from which they have removed the present crop. This lack of interest is also illustrated by the fact that included in industrial land is the bulk of the 20 to 30 million

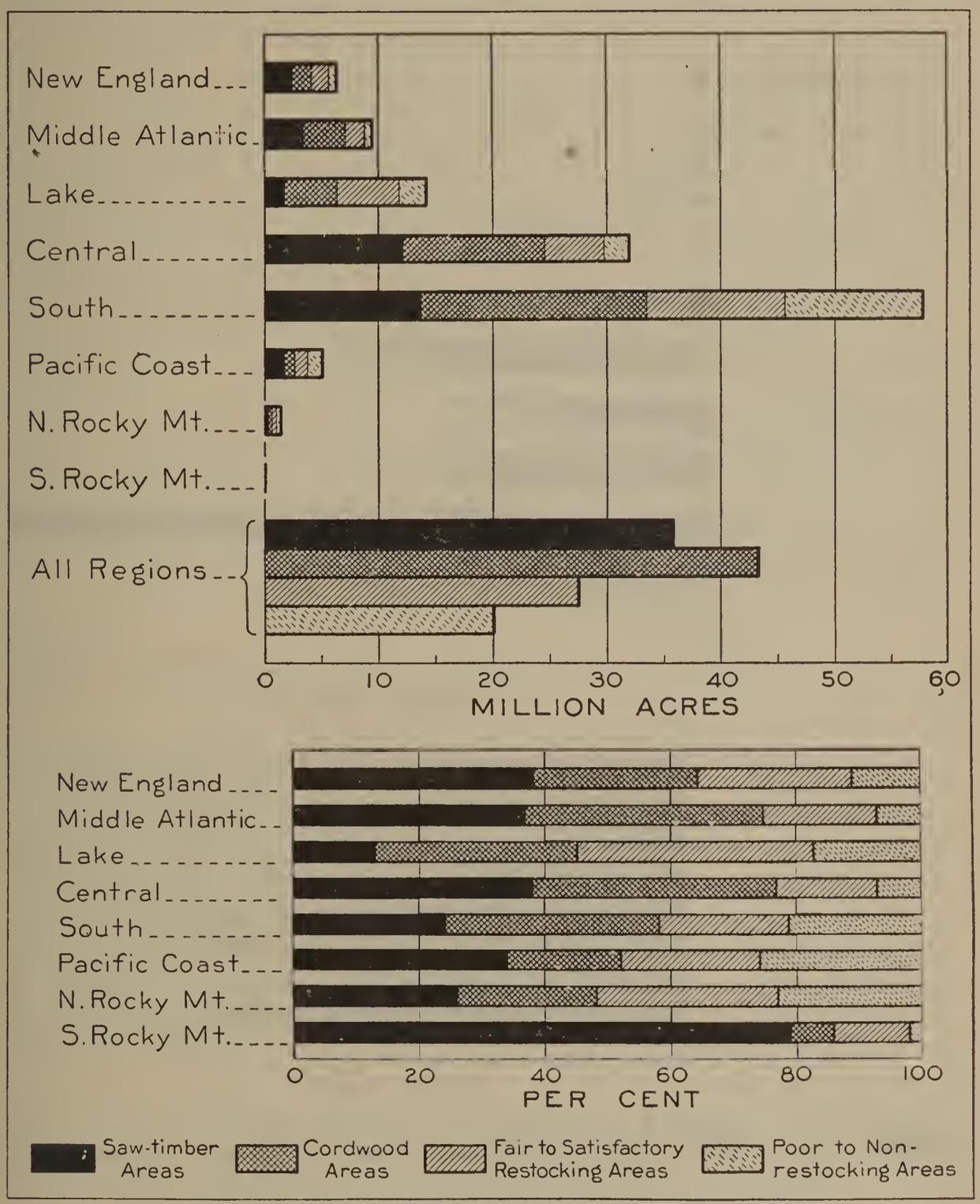

FIGURE 8.—Farm woodland (commercial) area by character of growth.

acres of cut-over forest land which is already reverting to public ownership (much more is in prospect), usually through tax delinquency and which, supplemented by abandoned farm land, largely makes up the so-called "new public domain", which is treated at length in the section, "Breakdown of Private Forest Land Ownership." This, in several regions, is causing severe economic and social disturbances. It constitutes a rapidly expanding and difficult problem in land utilization and planning.

FARM WOODLANDS

Farm woodlands constitute a very important and distinctive type of forest-land ownership and one well adapted, generally speaking, to keeping forest land permanently productive.

More than one fourth of the country's commercial forest land, or 127 million acres, is in farm woodland and of this, 95 percent is in

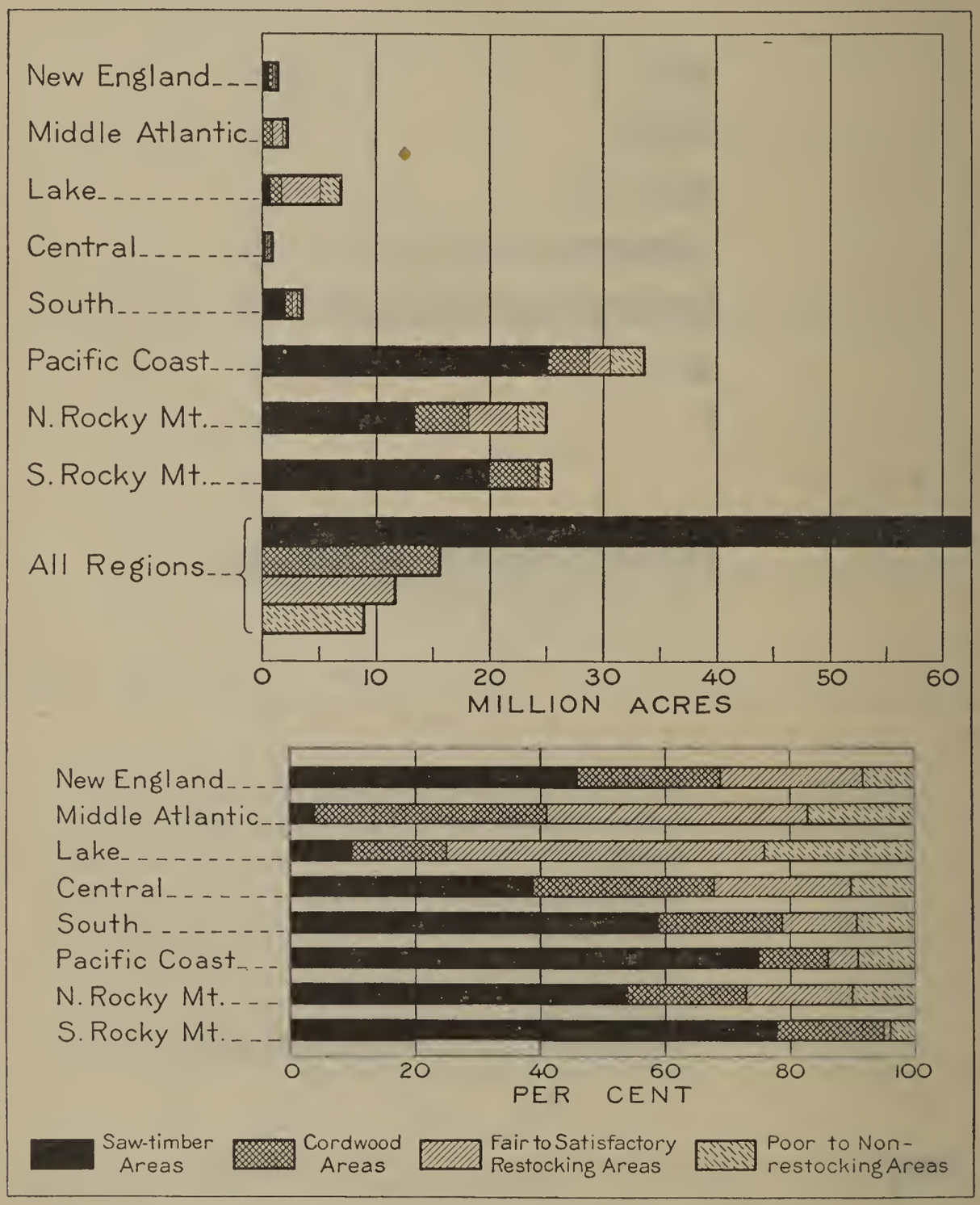

FIGURE 9.—Public (commercial) forest area by character of growth.

the eastern United States where it constitutes somewhat less than one third of the eastern commercial area. In the Central region it includes about one half and in the South and Middle Atlantic about one third of the commercial acreage. It is therefore in relative proximity, broadly speaking, to the great wood-consuming, wood-importing regions—a favorable factor, in that the most productive and profitable use of these lands depends upon markets to absorb the surplus timber products not needed for direct consumption on the farm.

The fact that a large proportion of the farm woodlands occur as relatively small separate tracts tends to facilitate fire protection and to render them less exposed to epidemic insect and disease attacks.

Farm forest-land owners characteristically do not own or operate the sawmill or other manufacturing plants using their raw forest material. They are thus relieved of the additional worries and problems which go with such enterprises and they are relatively free to handle their forest lands with primary reference to the welfare of these lands or that of the farm enterprise.

In a general way, farm woodlands constitute an important factor in the economy of many farms. They are an integral part of the farm with no special overhead costs. Not only do they furnish fuel, fence posts, and other domestic products but they provide employment during off periods, and produce a cash crop which in many instances has proven a lifesaver. Within the naval-stores belt, farm woodlands no less than other forest lands with stands suitable for turpentine cupping have the added advantage of a revenue from the lease of timber for turpentining or from the sale of resin.

In the nature of the case a partial or selective method of cutting is adapted to farm woodland conditions. Probably without much conscious effort on the part of the owners, partly because of rough selection methods of cutting, and with less fire loss, farm woodlands—except where they are heavily grazed—are believed to be on the average in better growing condition than other privately owned lands. This class of land is capable of further development in systematic timber cropping through measures that are both simple and practicable.

Figure 8 reveals that the situation as to relative areas of age classes for farm woodlands also varies markedly by regions. In the South, the most important region of all, farm woodlands appear to have a higher proportion of poor to nonrestocking land than in any other important farm-woodland region. The Lake region, as under other ownership, has a rather high proportion of this land and a very high proportion of restocking area. The farm-woodland situation appears relatively favorable in the New England, Middle Atlantic, and Central regions.

Notwithstanding that there is much room for improvement in the condition of farm woodlands, particularly in some regions, it is believed that farm woodlands in general lend themselves readily to good forestry practice as an integral revenue-producing feature of the farm economy. Consequently, except as farms fall in the submarginal category, and are abandoned or revert to public ownership, the farm-woodland aspect of the Nation's forest situation does not constitute a particularly critical problem.

PUBLIC OWNERSHIP

Of the 99 million acres in public ownership, or about one fifth of our total commercial forest land, the bulk—88 million acres—is owned or managed by the Federal Government, 9½ million by the States, and more than a million by counties and municipalities. (Table 3 and fig. 10).

The West and East afford a pronounced contrast in the proportion of commercial forest land in public ownership, as shown in figure 9.

This, of course, is largely because the national forests, which contain 75 million acres of commercial forest land, were established in the West mainly by Presidential decrees applied to large areas of public domain, much of which contained virgin forests. The relatively small acreage of national forests in the East is the result of a movement originating in 1899. As the acreage in Federal ownership was negligible, the movement depended almost entirely upon purchase of land. About 4¾ million acres, largely cut-over lands, have been purchased to date, which combined with about 2½ million acres reserved from the public domain or acquired by exchange brings the total to over 7 million acres. The fact that the national forests in the East were developed in this way is one of the main reasons for the relatively high proportion of restocking and non-restocking and the low proportion of saw-timber lands in public ownership in these regions. Effective consolidation of the existing units will require the further purchase of approximately 7½ million

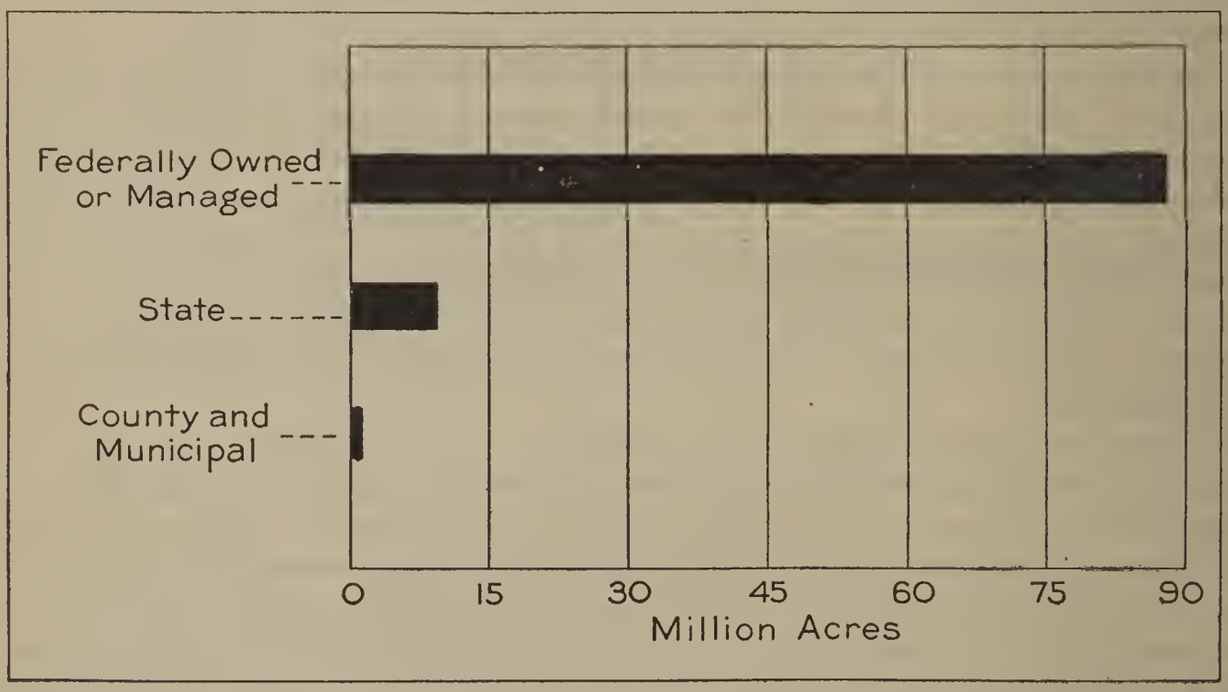

FIGURE 10.—Distribution of public ownership of commercial forest area of the United States.

acres, but the situation requires many new units and a much greater area under public control.

Indian reservations include some 7 million acres of federally managed commercial forest land, and the public domain still contains most of the remaining 6 million acres federally owned. These, like the national forests, are mostly in the West.

Each forest region contains some State, county, or municipally owned forest land. It will be noted that of the 11 million acres of this land, more or less, nearly 4 million are in the Lake region.

Public ownership, broadly speaking, is the most stable type of forest-land ownership and in this respect, therefore, the most favorable for the continuous production of forest crops, or in other words for sustained yield. There is not the same incentive as in the case of the private owner for immediate as opposed to deferred returns. Long-time policies of management once adopted are not likely to be upset at the instance of a single individual. The indirect and collective forest benefits to the public at large may be more logically and effectively provided for in the management. Though by no means all of it, the bulk of the publicly owned forest lands are either now

subject to conservative forestry practice, or are assured of such treatment when cutting shall take place. The main exception to this, of course, is the forest land which still remains in the public domain. Another important exception is the Oregon and California land grants upon which the timber under existing laws is being cut with little or no regard to maintaining the forest productivity of the land. (See section "Public Domain and Other Federal Forest Land.")

Public ownership, often accompanied by restrictions in private forest-land management, has long been accepted in many countries as the chief safeguard against the impairment of the sustained productivity and economic values of the forest resources of those countries. For the United States as a whole, the 20 percent publicly owned forest land is decidedly less than the proportion in the most of the older European countries. For example, in Germany 52 percent, in France 35 percent, in Sweden 24 percent, in Austria 28 percent, in Italy 35 percent, and in Switzerland 72 percent are publicly owned. The contrast, of course, is much greater for the eastern United States, where public forests include only 4 percent of the total commercial forest land.

Public forests are, generally speaking, a recognition of the difficulties experienced by private ownership in coping with the many perplexing problems involved in the practice of forestry. Obviously, unless greatly expanded, public ownership can not replace but rather can serve only to supplement timber production on privately owned forest lands. Publicly owned forest lands, in addition to their part in current and sustained yield production of timber products, serve as an assurance of timber supplies available in quantity to meet possible future emergencies.

It is not within the province of this section to outline a policy or program for the expansion of public forest lands from the standpoint of timber use but rather to present some of the outstanding aspects of the forest-land and land-ownership situation as it exists. It may be appropriate to say in passing, however, that the preparation of a public-ownership program will necessarily give consideration to the evident opportunity for large extension of public ownership in the eastern United States especially. However logical it might appear to rely upon public ownership as the main solution of our timber supply and other forest-land problems, it will be necessary to consider the practical difficulties, financial and otherwise, that would be faced in taking the bulk of the Nation's forest lands into public ownership. As a practical proposition, therefore, it would appear that a national forestry program should involve material extension of public ownership, by States, counties, and municipalities as well as by the Federal Government, but that it must also rely in important part upon the wise and conservative management of a large area in private ownership, both industrial and farm woodland.

THE PROTECTIVE FUNCTION OF FOREST LAND

Water is a basic resource of such widely varied necessity and usefulness in our individual and national life that its value can hardly be measured. Water for domestic and municipal use, navigation on our rivers and lakes, the operation of hydroelectric plants, and irrigation are outstanding examples. For these and many other purposes easily

available water supplies in satisfactory amount and condition are limited, and our needs have been met thus far only with enormous effort and cost. Forested lands favorably influence the "water crop" in so many ways and to such an extent that the protective values inherent in these forest influences rival those of any other use of forest land.

Floods ordinarily cost us something like 40 million dollars annually, to say nothing of the expenditures for engineering-control works. Single floods sometimes amount to calamities. The Mississippi flood in 1927 is estimated to have cost some 300 million dollars. Forests will not prevent floods but adequate areas of forested land strategically located exercise such a favorable influence that no effective plan for flood control can fail to include forest lands as one essential element.

Forest cover delays the melting of the snows, the litter retards run-off, and the soil is very porous; these together induce soil absorption of water in the forest at a rate many times greater than for field or cultivated lands. The effect is measurably to retard and reduce flood peaks and, therefore, the destructiveness of floods.

The reduced and retarded run-off on forested land, the absorption of water by the soil, and the soil-holding effect of the tree roots combine to prevent the washing away or erosion of forest soils. Investigations have revealed that but a fraction of 1 percent as much soil per unit of area is eroded from forest land as from open-crop land. Surface erosion depletes the fertility of the land. In the aggregate, soil and fertility losses by erosion on cultivated and open land are tremendous. It has been estimated that 7 inches of the top soil of such lands in Illinois has been lost through erosion. The erosive effect of silt-laden streams is much greater than where the water is clear; the silt is deposited in reservoirs, clogs up hydroelectric plants and engineering works, forms sand bars and otherwise interferes with navigation, and prevents the use of the water for domestic and certain industrial purposes. The beneficial effects of forested lands strategically located on river watersheds in reducing erosion and its resultant ills are therefore diverse and highly important.

The benefits of forest cover in keeping water in springs, streams, and reservoirs clear and pure for domestic use are universally recognized. An adequate supply of domestic water for our urban centers has become a vast and expensive problem. San Francisco is securing water from the Sierras 200 miles away; Los Angeles across 200 miles of desert and mountain from Owens River; New York City is drawing its supply from the Catskills by costly conduit and is reported to be looking for additional sources at much greater distance. The importance to navigation of clear water and stabilized flow and to the enormous hydroelectric plants, are too obvious to require description. The importance of clear and permanent streams to fish life and to recreation generally are perhaps not so widely appreciated but are none the less important.

The shelter against strong drying winds afforded by forests to homes, crops, and livestock is very important in some localities and constitutes a definite protective function of forest land. This function also includes protection against shifting sands and the formation and movement of sand dunes.

The protective value of forested lands is largely independent of the exact type of cover though not of its condition. The dense spruce

forests of high altitudes and northerly latitudes, the hardwood forests of the Appalachians, the mixed forests of the Piedmont region, the open scrubby piñon of the West, the chaparral of the Southwest, and the brushy windbreak stands all possess high protective values. Therefore, the protection value of forest lands is somewhat independent of their value for timber production. Some of the forest lands most valuable for protection are not classed as commercial.

In the neighborhood of four-fifths of the total 615 million acres of forest land may be classed as valuable for protection. The exceptions are swamp lands and bottom lands at the mouths of rivers, and lands having such sandy or gravelly soil that the presence or absence of forests would have practically no effect on the behavior of streams or the process of erosion.

The protection-forest lands controlling run-off and erosion are on the whole well located on the headwaters of important streams. From the point of view of protection, however, there is considerable need for additional areas of forested land on many relatively small streams, as well as in strategic locations on the watersheds of several important streams of which the Ohio, Missouri, Hudson, Delaware, and Sacramento are examples.

With some exceptions, such as municipal watersheds, other forest uses need not be excluded for the sake of the protective function. Timber growing and utilization under systems of practices which will provide for maintenance and protection of a forest cover in conformity with the dictates of good timber management would, generally speaking, prevent serious impairment of forest influences. Under existing practices, however, especially on large areas of both public and private land, the situation is far from satisfactory. From the standpoint of protection, the forest should not be cut so severely that the ground is unnecessarily exposed. Continued absence of cover will hasten run-off and induce erosion. In many cases partial cutting that would fully maintain the forest influences would be financially advantageous from the standpoint of timber use.

The forest should be amply protected against fire, especially following cutting. By destruction of the litter, and in other ways, fire greatly aggravates deterioration in forest influences. The forest land should not be grazed so heavily as to prevent restocking, or to destroy ground cover and leaf litter. Such grazing leads to increased erosion and floods.

The unsatisfactory protection condition on many private tracts of forest land, the need for additional strategically located areas of public forest, and the present very low percentage, 4 percent, of commercial forest land in public ownership in the East—all indicate the advisability of giving consideration to the protective function of forest land, as well as to timber use and other needs, in formulating a program of public acquisition in the East.

THE USE OF FOREST LAND FOR RECREATION

Recreation is by far the most direct contact which most Americans have with the forest. The growing and utilization of timber and the protection of watersheds are at best theoretical considerations with the majority of people who have directly experienced the forests' value for relaxation, for play, and for aesthetic enjoyment.

The available figures for recreational use of public lands during 1931 indicate that there were more than 3 million visitors to national parks, about 32 million to national forests, and probably 50 million to State parks and forests. While there is a great deal of duplication among the visitors thus recorded, it is patent that a very material proportion of our population made some use of Federal and State forest lands for recreation. The number who had recourse to municipal, county, and private forests can only be conjectured, but it must have been very large. Recreation, then, is a tremendously important forest-land use today, and every indication points to a great increase in its volume in the future.

The forms which forest recreation takes are of wide variety. The largest fraction of the recreationists only pass through the forests in their autos. A considerable group, however, establishes residences in the forest for some portion of the year. Hunting and fishing is one of the most popular forms of forest recreation, it being estimated that 13 million people indulged in those sports during 1929. The number of people who go hiking, riding, or canoeing every year runs well into the millions. Most of these merely go on journeys of a single day or less, but there are increasing hundreds of thousands who are going on at least overnight trips into the forest, some of them staying away from civilization for weeks at a time.

The recreational needs of these vast numbers of people may be satisfied in many cases by lands which are being used for timber production, especially if methods of cutting and safeguards for restocking and protection in keeping with the dictates of good timber use are exercised. Recreational values will usually be temporarily suspended during logging and often during the periods required for forest regeneration. Otherwise, it may be said that, broadly speaking, all forested land under sustained-yield management is valuable for recreation.

There will be certain areas, however, which have such exceptional recreational value that they will need to be withdrawn from commercial timber use. These will include areas of superlative scenic value, samples of primeval forest conditions, some wilderness areas, wooded strips along the main traveled highways, camp grounds, and hotel and summer-home sites. Included also will be some 6 million acres of forest land required to satisfy the needs of those who wish to purchase forest land solely for home sites or other recreational purposes.

Further, a certain amount of commercial forest land will need to be reserved in the neighborhood of population centers where the intensive recreational use promises so to congest the available woods that almost no timberland can be spared for even the few years required by most forest types to recover a semblance of scenic value under the best silvicultural practice.

Table 4 indicates very roughly by regions the approximate acreage which it may be desirable to reserve for recreational use. Of this, approximately one tenth will be permanently withdrawn in private ownership. Reservation of the remainder, for the most part in public ownership, does not necessarily mean that no timber will ever be cut on any of this area; but rather that for the present its recreational value seems so high that no commercial logging operations should be planned, even though light selection cuttings may be permitted on special tracts.

In the West, it will be observed, a large share of the additional recreational withdrawals may be confined to lands where timber production probably would have no practical significance for many years. In the East, where there is relatively little inaccessible land, the recreational withdrawals will have to come from lands which would otherwise play a part in timber use. Recreational needs should, therefore, be an important consideration in formulating a program for public acquisition of forest land in the East.

TABLE 4.—*Estimated area of present commercial forest land that may well be reserved for recreation*

Region	Total area	Already withdrawn	Additional withdrawal	Withdrawals of low production value
	Acres	*Acres*	*Acres*	*Acres*
New England	6,000,000	100,000	5,900,000	----------
Middle Atlantic	8,400,000	2,500,000	5,900,000	----------
Lake	4,000,000	2,600,000	1,400,000	----------
Central	2,900,000	500,000	2,400,000	----------
South	3,500,000	600,000	2,900,000	400,000
Pacific Coast	9,500,000	1,800,000	7,700,000	5,900,000
North Rocky Mountain	6,200,000	400,000	5,800,000	5,100,000
South Rocky Mountain	4,500,000	2,500,000	2,000,000	1,600,000
Total	45,000,000	11,000,000	34,000,000	13,000,000

USE OF FOREST LAND FOR GAME

The social and economic values contained in wild life are of far reaching importance in the multiple-use management of forested areas. Forest lands in one form or another furnish the environmental conditions in whole or in part for all classes of game, fur bearers, and other wild life except that which prefers open country and unwooded marshland. Direct economic values attributable to game include those of food and fur, and income from sale of hunting and fishing licenses. Indirect values include the market afforded by hunting and fishing to manufacturers of arms, ammunition, fishing tackle, clothing and other outdoor equipment; expenditures of sportsmen for board, transportation, guide service, and sundry supplies; annual expenditures of sportsmen and clubs for hunting and fishing privileges in private lands; and benefit of wild life, chiefly birds, as destroyers of insects preying on agricultural crops. These various values total well over 1 billion dollars per annum according to W. L. McAtee, of the United States Biological Survey, who has made an intensive study of the subject. For the State of New York, for example, estimated expenditures of hunters and fishermen were more than 14 million dollars in 1931.

Revenues from a game crop can be secured by proper management measures. Present-day problems of land management and awakening recognition of wild-life values, are turning the attention of land managers and economists to the potentialities of game as a forest land resource. Experience tends to demonstrate that game values are an important source of income, particularly during long periods needed for rehabilitation of depleted forest areas.

Social values of forest game life are far-reaching. Game and fish are closely associated with recreation. Additional leisure for the

average man through shorter hours and less days of work will add tremendously to those who seek the "out-of-doors" form of recreation. Hunting and fishing will attract large numbers of these folk. Wild life in general affords enjoyment, the opportunity for building health and character, and for increasing scientific knowledge. In the report of the Special Committee of the United States Senate on Conservation of Wild Life Resources, it is conservatively estimated that there is a 400 percent increase during the decade ending with 1930 in the number of people who enjoyed the pastimes of hunting and fishing.

Most, if not all, of the forest land of the United States is susceptible to the production of one or more species of wild life having social or economic values.

THE RANGE RESOURCE OF FOREST LANDS

The forage produced by herbaceous and shrubby plants under the trees and in openings in the forest is one of the major resources of forest lands. More than half the forest land of the country is grazed by domestic livestock. Feed furnished, for periods of 3 months in the higher mountains or the full year on some low elevation forest ranges, amounts to about 12 percent of all pasturage of the United States. Grazing furnishes a current return to many timberland owners, it aids in fire protection, and helps to make forests accessible with roads and trails. This forest land use is of two general types: The range type, which predominates in the West and South and to some extent in the Appalachians, and the woodland pasture type typical of the central farm belt.

The extensive forest lands of the West, largely occupying the mountain areas, furnish a considerable percentage of the summer feed for the beef cattle and sheep of the Rocky Mountain and Pacific Coast States. The nutritious forage, cool climate, and shade of forest lands all combine to facilitate growth of calves, lambs, and wool.

Within or near almost every western forest-range area there are agricultural communities whose prosperity is mainly dependent upon the production of livestock. Many of the farms within these communities are small and far from markets. Without the aid of complementary forest land range, however, most of such farms could not long exist. These forest ranges, with their ability to produce high quality beef and mutton at a nominal cost for forage, are indispensable in offsetting the more expensive production and feeding of cultivated crops. More than 4½ million acres of improved farm land and 22 million acres of private or leased grazing land, for example, are used in connection with the 83 million acres of national-forest land now grazed. Without forest ranges a large proportion of associated farm lands and the community life dependent upon them would never have been developed so satisfactorily.

In the South there are already over 100 million acres of cut-over pine lands alone. After logging operations, grass and other herbs and shrubs become abundant and often form a nearly complete cover. These native ranges, ordinarily unfenced, furnish good grazing from early spring until July or August, and for that period grazing capacity is relatively high. After October, the native grasses are coarse and wiry and the forage for grazing inferior.

Although forest lands are usually grazed by the livestock of local residents, these residents seldom own them or lease the land from the large timberland owners. Characteristically, the land has been burned annually, especially since turpentine operations began. The turpentine operator has burned in winter to safeguard the trees he is operating against accidental summer fires which cause great damage. The native cattle owner burns in the belief that he will improve the forage. Such burning on cut-over lands may damage timber reproduction or even kill it, as in the case of slash pine. It is also apt to slow down the growth of the larger trees.

In the Central States region, characteristic of the woodland pasture type of range, about a half of the commercial forest land is farm woodland, of which over a half is grazed. Outside of the "blue grass" regions of Kentucky and Tennessee where the forest has been intentionally opened up to provide better pasture, farm woodlands are grazed with a view to producing such supplemental revenue as can be obtained. In the four Corn Belt States—Ohio, Indiana, Illinois, and Iowa—over three fourths of the timbered area is in farm woodlands, and nearly three fourths of this area is grazed. In this region the forested lands are used more for shade, shelter, and incidental roughage than for the primary purpose of forage production.

Under sound forestry practice grazing may, generally speaking, be exercised in coordination and harmony with the other major forest-land uses; in some types, however, grazing may have to be temporarily suspended during forest regeneration. At all times it should be practiced conservatively, not only to avoid impairing forest-protection values, but also to avoid the depletion of the forage resource itself.

On certain municipal or other intensive domestic water-supply areas grazing has been excluded altogether. Where certain types of wild life are the object of management—as, for example, deer—it may be desirable to restrict or eliminate grazing. On certain areas heavily used by recreationists all the forage may be required for the grazing of pack stock.

Probably the most extensive and noteworthy example in the world of regulated grazing use coordinated with the other forest-land uses is to be found on the national forests. Efforts, effective on the whole, have been made to obtain efficient use of the forage, to prevent depletion, and to rehabilitate ranges previously depleted. Forage use is adjusted to meet the requirements for timber use, protection, recreation, and game. In varying degree similar coordination of grazing with other uses is secured on other publicly owned or managed lands.

Such control and coordination are not secured on the public domain forest lands nor as a rule upon privately owned forest range in the West. Consequently the forage resources of these lands are usually depleted and at least the protective functions rendered less effective. In much of the East the forage resource is less susceptible to overgrazing, but in many woodland pastures within the hardwood types constant grazing has been responsible for the nonestablishment of young forest growth, and the progressive deterioration of the forest stand.

SUMMARY OF FOREST LAND SITUATION

PRESENT AREAS

In all, 615 million acres, or one third of the continental United States, is forest land. This forest land is a basic resource, adapted to five major uses, each of which constitutes a large and essential phase of our economic and social life. With some important exceptions, as in cases where tracts of forest land are designed to serve a highly specialized purpose, these uses need not be mutually exclusive. On the contrary, forest land characteristically, insofar as economic circumstances make it feasible, may efficiently serve several or all uses at one time, and constitutes a multiple-use resource of vast proportions and importance.

These five major uses or functions of forest land may be summarized as follows:

TIMBER USE

Wood in various physical and chemical forms has long been an essential commodity to mankind. When this country was settled by the white man it was providentially endowed with a vast store of virgin timber—a natural supply which has furnished us the greater portion of the wood for commercial use. These virgin supplies are substantially cut out in the eastern United States. The remaining reservoir of virgin timber is in the West. It is not unlimited. To continue to supply the needs of the country for timber and wood products, forest land must be used to grow successive crops of timber in somewhat the same manner that agricultural lands are used to grow agricultural crops.

Of the total of 615 million acres of forest land, about 495 million acres of what in this report is called commercial forest land is considered to be capable of growing a volume and quality of timber that under recent or reasonably conceivable future conditions may be economically available for consumption. This commercial forest land, which does not include productive areas withdrawn for one reason or another from commercial exploitation, occupies about one fourth of the area of the United States. It exceeds by a wide margin the area of land actually in agricultural crops.

The following tabulation shows nationally a broad classification of this commercial forest area by present condition of forest cover:

	Acres
Old growth (mature) saw timber	99, 000, 000
Second growth (immature) saw timber	90, 000, 000
Cordwood areas (characterized by trees of cordwood size)	121, 000, 000
Logged or burned:	
Fair to satisfactory restocking	102, 000, 000
Poor to nonrestocking	83, 000, 000
Total for the continental United States (exclusive of Alaska)	495, 000, 000

The whole of this gross area is not now nor will it be likely to be effective producing forest-land capital for a great many years. Considerable areas are economically inaccessible under present conditions. Much of the 83 million acres described as poor to nonrestocking will have to be planted before it can produce a merchantable timber crop.

Some future withdrawals from timber use will be desirable for special purposes. It is roughly estimated that 34 million acres addi-

tional should be thus withdrawn from the commercial category for recreational purposes. On the other hand, the area of commercial forest land available for timber use may be increased by reforesting areas of abandoned or other agricultural lands which are deemed no longer essential for agriculture. This aspect of the land situation is referred to later in this summary, and in more detail in the section, "Agricultural Land Available for Forestry."

From the standpoint of timber use, the character of ownership of forest land is important. The following tabulation summarizes the distribution of the present acreage of commercial forest land for the three broad classes of ownership:

	Acres
Publicly owned or managed forest land	99, 000, 000
Industrial forest land	269, 000, 000
Farm woodlands	127, 000, 000
Total	495, 000, 000

The previous discussion emphasizes the fact that the publicly owned land is nearly all located in the West while the farm woodlands are mostly in the East.

PROTECTIVE FUNCTION

It is estimated that on approximately four fifths of the forest land of the country forest influences have a definite protective effect expressed in the regulation of stream flow, the maintenance of water supply, the prevention of erosion, and the amelioration of destructive winds and other severe climatic conditions.

However, relatively little of this area should be withheld from timber or other use for the sake of protection. Among the few exceptional tracts are some protecting municipal watersheds. In general, when managed under practices which are satisfactory from the timber use standpoint, forest land will sufficiently fulfill its protective and other functions simultaneously. The fact is brought out in this report, however, that under present conditions large areas of forest land exist which, because of present forest cover, are not satisfactory protection forests.

RECREATIONAL USE

Recreation, broadly defined as the use of the forest for play, relaxation, aesthetic enjoyment, and inspiration, is a tremendously important and rapidly growing forest-land use. In general all forest land, if it has not been severely damaged by fire and logging, is potentially adapted to some form of recreational use. Some forest land has such high recreational value, however, that it should be set aside entirely from commercial development. Already 11 million acres of forest land, of which the national parks are the outstanding example, are withdrawn from commercial timber use on account of recreational values. It is estimated in this report that eventually an additional 34 million acres should be withdrawn from the commercial forest land category for recreational purposes. A considerable portion of this will fall in the least accessible zones of commercial forest land and therefore the conflict with timber use needs will not be so great as might be implied by the figures alone.

GAME AND WILD LIFE

The great bulk of forest land is capable of producing game and wild life. However, the condition of the forest cover is an important factor in the extent and character of the food supply. Cutting operations usually lead to increased growth of shrubs and herbage, thus providing a greater abundance and variety of food than is to be found in dense forests. In general, the protection of forest land from fire, and the application of desirable silvicultural measures in the development and use of the timber resource, contribute to the welfare of wild life. The character of the ownership of the land is also an important factor as it affects access to the land by the public, and the possibilities for effective correlation of wild life and land management.

RANGE USE

This use is exercised over more than half the forest land in the United States. As a rule, grazing may be harmonized satisfactorily with other major forest-land uses. In some instances it should be temporarily suspended during forest regeneration. At all times it should be exercised conservatively to guard against damage to the forest-protection values and against depletion of the forage resource itself. On certain intensive protection areas it should probably be excluded altogether.

Forest-range conditions are far from uniformly satisfactory. On the unregulated public as well as much of the privately owned forest land of the West, and on much of the forested pasture land of the East, grazing has been exercised with little regard for the forage resource itself or for the values of the forest land for other purposes.

Any one of these major uses is essential to national welfare. In the aggregate they give some conception of the great importance of forest land. It is of the utmost importance that forest land should serve these uses effectively and also that these uses be maintained, developed, and harmonized in order that no considerable part of so fruitful a resource need lie idle and unproductive.

The practice of forestry in the broad sense then means much more than the mere production of timber. It includes the management of forest lands, usually with timber production as one of the major uses, but not an exclusive one. It means the management of forest lands to secure a maximum of coordination and combined effectiveness in all these uses.

AGRICULTURAL-LAND ABANDONMENT

The forest-land situation is by no means static. The process of converting forest land to farm land is still going on, particularly in the western regions where the removal of virgin timber from a land of favorable soil and climate invites settlement. It is roughly estimated that some 2 million acres should be deducted from the commercial forest-land acreage to account for such present and prospective conversion.

While this process is continuing on a small scale in the West the opposite process—agricultural-land abandonment—is taking place on a major scale in the regions of the Eastern United States. The future progress and the net effects of these transitions are not susceptible of refined determination. They are the result of complex and changing

economic and social conditions. The best information now available appears to indicate that so far as the relation between forest and agricultural use is concerned, the national trend is likely to continue from agricultural to forest use for a good many years.

The section, "Agricultural Land Available for Forestry," discusses the relation between agriculture and forest use and the resulting trends in considerable detail. It is sufficient here to note that about 52 million acres of land once or still considered as agricultural, and not included in the present forest-land acreages previously presented in this report, is no longer needed for agriculture and may be considered as available for forest use. This acreage is made up as follows:

	Acres
Abandoned agricultural land	26, 000, 000
One half of the 1930 Bureau of the Census estimate of the idle and fallow agriculture land	11, 000, 000
One half of the unforested and unplowable pasture land	15, 000, 000
Total	52, 000, 000

This 52 million acres, occurring as it does in the East and within the territories once cleared for agriculture, may, for practical purposes, be considered as commercial forest land, if and when forested. Because of its location, it would be very valuable for protection, for which use some minor areas might need to be set aside exclusively. Generally speaking, its site quality would make it very desirable for timber production, probably somewhat more so than the average cut-over and nonrestocking land now included in the commercial forest-land category.

A further possible addition to forest-land acreage is found in certain areas of treeless prairies in the Central States which never have been forested but which are considered to be physically suited to afforestation. A figure of 3 million acres will be ample to provide for this.

PROSPECTIVE AREA AVAILABLE FOR TIMBER PRODUCTION

The net effects of such estimated amounts upon present or potential commercial forest-land acreage may be summarized as follows:

	Acres
Present acreage of commercial forest land	495, 000, 000
Present acreage of agricultural land abandoned or otherwise available for forestation	52, 000, 000
Acreage of treeless prairies available for afforestation	3, 000, 000
Gross acreage of potential commercial forest land	550, 000, 000
Area of present commercial forest land to be withdrawn for recreation	34, 000, 000
Deduction for conversion from forest to agriculture in the West	2, 000, 000
Miscellaneous deductions for protection, etc	5, 000, 000
Gross acreage of prospective withdrawals	41, 000, 000
Net acreage of potential commercial forest land	509, 000, 000

An additional 25 to 30 million acres of agricultural land in the eastern United States may become available for afforestation by 1950 according to an estimate contained in the section, Agricultural Land Available for Forestry. Because of its location and character this

area, like the 52 million acres just considered, may be considered as suitable for commercial timber production and for protection purposes.

Thus, of gross forest-land acreage there appears to be ample, according to the discussion headed Present and Potential Timber Resources, if it is wisely managed, to meet the ultimate timber-supply needs of the country and at the same time to serve adequately the other major uses. To make these potentialities realities will require constructive programs which will provide for improvement in many phases of forest-land use.